



National Transportation Safety Board Aviation Incident Final Report

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| Location: | Bismarck, ND | Incident Number: | ENG071A030 |
| Date & Time: | 06/04/2007, 0530 | Registration: | N136DH |
| Aircraft: | LEARJET 36 | Aircraft Damage: | Minor |
| Defining Event: | | Injuries: | 2 None |
| Flight Conducted Under: | Part 91: General Aviation - Business | | |

Analysis

A Learjet 36A experienced a bird strike on the right hand engine during takeoff. One fan blade of the engine fractured below the mid-span and all others had tears on the leading edges.

Some of the liberated fan blade fragments were ejected through the engine fan case just forward of the fan containment ring in three different clocking locations. One fragment passed through the top portion of the oil tank, breaching it. Another ejected blade fragment penetrated the nacelle skin but neither was in the direction of the fuselage, thus limiting the damage only to the nacelle. The bird was identified as a male mallard duck.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: A total loss of engine power during takeoff due to the right engine sustaining a fractured fan blade after the ingestion of a mallard duck. Some liberated fan blade fragments were uncontained, penetrating the nacelle.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF - ABORTED

Findings

1. (C) COMPRESSOR ASSEMBLY, FORWARD FAN - FOREIGN OBJECT DAMAGE
2. (C) OBJECT - BIRD(S)
3. (F) MISC, ENGINE UNCONTAINED FAILURE - FOREIGN OBJECT DAMAGE

Factual Information

On May 4, 2007, at approximately 1030z (0530 local), a Learjet 36A, registration number N136DH, equipped with two Honeywell TFE731-2-2B turbofan engines, ingested a bird in the right engine while accelerating for takeoff at the Bismarck Municipal Airport (KBIS). The takeoff was aborted at about 110-120 knots and the airplane was brought to an uneventful stop. The airplane's drag chute was deployed and moderate braking was necessary to get the airplane stopped. Approximately 2,000 feet of runway remained when the airplane taxied off the runway and on to the taxi way. Once the airplane was off the runway, the crew scanned the engine instruments and annunciators. The engine instruments appeared normal and the right engine fuel computer annunciator was illuminated. As the power levers were advanced to taxi, the right engine fuel flow fluctuated erratically and crew felt a vibration so the right engine was shut down. The vibrations stopped and the aircraft was taxied to the FBO uneventfully on one engine. The crew reported that they did not see the bird strike the airplane but described the engine event 'a loud pop like the sound of a compressor stall and then a vibration in the whole airframe with a slight pull to the right'. The flight, operated under the provisions of Title 14 CFR Part 91, was a local flight intending to perform geophysical mapping. It was the first flight of the day for this aircraft. No injuries were reported by the two crewmembers.

The post flight inspection report indicated that blood was found along the right engine cowling and along the right side of the fuselage. Approximately one quarter of the retaining rivets on the forward engine inlet cowling were sheared or popped. There was a 3 inch gash in the right outboard cowling above the oil filler port and the aft cowling was perforated and scored. A second blade fragment penetrated the nacelle skin but none of fan blade exit trajectories were in the direction of the fuselage, thus limiting the damage only to the nacelle. No damage was noted to the engine pylon, fuselage, or surrounding wing and flaps.

The airport authority conducted a runway foreign object check and found the head of a mallard duck on the runway. No other debris was found. A Bird Strike report was filed with the FAA and sent to the Office of Airport Safety and Standards AAS-310.

Inspection of the right hand engine revealed that one fan blade was fractured below the mid-span and was missing approximately one half of its material. Eight other blades had lost segments of their leading edge corners while all others had tears on the leading edges. Some of the liberated fragments were ejected through the engine fan case just forward of the fan containment ring in three different clocking locations. There was damage and perforations to the low pressure and high pressure bleed air lines. One fragment passed through the top portion of the oil tank, breaching it. The dimension of the largest penetration in the fan case was 7 inches by 1.5 inches. Visual examination by the NTSB material laboratory of the remaining fracture surfaces of the fan blades revealed no preexisting fatigue-type mechanism and all the fractures were consistent with overstress.

Bird remains were forwarded to the Smithsonian Institution who identified them as a male Mallard Duck (*Anas platyrhynchos*). The average weight of this species is 1,100 grams. The strike information was entered into the FAA Wildlife Strike database.

Although the weight of an average duck is known, it was not possible to estimate the quantity ingested by the engine because remains of the duck were found smeared on the outside of the nacelle indicating that only a part of the duck was ingested into the engine.

Aircraft and Owner/Operator Information

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|-------------------------------|-----------------------|--------------------------------|-------------|
| Aircraft Make: | LEARJET | Registration: | N136DH |
| Model/Series: | 36 A | Aircraft Category: | Airplane |
| Year of Manufacture: | | Amateur Built: | No |
| Airworthiness Certificate: | Transport | Serial Number: | 36-036 |
| Landing Gear Type: | Tricycle | Seats: | 10 |
| Date/Type of Last Inspection: | Unknown | Certified Max Gross Wt.: | 18300 lbs |
| Time Since Last Inspection: | | Engines: | 2 Turbo Fan |
| Airframe Total Time: | | Engine Manufacturer: | GARRETT |
| ELT: | Not installed | Engine Model/Series: | TFE731 |
| Registered Owner: | Intermap Technologies | Rated Power: | 3500 lbs |
| Operator: | Intermap Technologies | Operating Certificate(s) Held: | |

Meteorological Information and Flight Plan

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|----------------------------------|---------------------|--------------------------------------|---------|
| Conditions at Accident Site: | | Condition of Light: | |
| Observation Facility, Elevation: | | Distance from Accident Site: | |
| Observation Time: | | Direction from Accident Site: | |
| Lowest Cloud Condition: | | Visibility | |
| Lowest Ceiling: | | Visibility (RVR): | |
| Wind Speed/Gusts: | / | Turbulence Type Forecast/Actual: | / |
| Wind Direction: | | Turbulence Severity Forecast/Actual: | / |
| Altimeter Setting: | | Temperature/Dew Point: | |
| Precipitation and Obscuration: | | | |
| Departure Point: | Bismarck, ND (KBIS) | Type of Flight Plan Filed: | Unknown |
| Destination: | Bismarck, ND (KBIS) | Type of Clearance: | Unknown |
| Departure Time: | | Type of Airspace: | Unknown |

Airport Information

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|----------------------|-----------------|---------------------------|---------|
| Airport: | Bismarck (KBIS) | Runway Surface Type: | Unknown |
| Airport Elevation: | 1654 ft | Runway Surface Condition: | Dry |
| Runway Used: | | IFR Approach: | None |
| Runway Length/Width: | | VFR Approach/Landing: | None |

Wreckage and Impact Information

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|---------------------|--------|----------------------|-------|
| Crew Injuries: | 2 None | Aircraft Damage: | Minor |
| Passenger Injuries: | N/A | Aircraft Fire: | None |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Total Injuries: | 2 None | Latitude, Longitude: | |

Administrative Information

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|-----------------------------------|--|--------------|------------|
| Investigator In Charge (IIC): | Harald Reichel | Report Date: | 03/16/2011 |
| Additional Participating Persons: | | | |
| Publish Date: | 03/16/2011 | | |
| Investigation Docket: | NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ . | | |

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).